

Symptomatology of chronic brucellosis

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McDevitt, D. G. (1973). *British Journal of Industrial Medicine*, 30, 385-389. **Symptomatology of chronic brucellosis.** A survey of the occurrence of symptoms commonly attributed to chronic brucellosis was carried out by questionnaire in four different occupational groups in Northern Ireland—veterinary surgeons working in private practice, veterinary surgeons employed by the Ministry of Agriculture, general medical practitioners, and a group of forestry workers. The veterinary surgeons generally had a higher incidence of symptoms than the other two groups. This could not be accounted for by age, heavy physical exertion or professional familiarity with disease but could be related to contact with cattle and hence to possible brucella infection. Of the symptoms investigated, sweating, weakness, malaise, irritability, depression, rheumatism, arthritis, and backache occurred significantly more often in the veterinary surgeons than in the others, with selective differences between the types of veterinary practice: the alimentary system symptoms, headache, and insomnia were more evenly distributed between all groups and their inclusion as part of the chronic brucellosis symptom complex must be seriously questioned. The lack of specificity of the symptoms, their occurrence in normal persons, and the finding of high serological brucella antibody titres in asymptomatic persons who are exposed to brucella infection emphasize the need for caution against overdiagnosis. This need is illustrated by the fact that a higher proportion of Ministry veterinary surgeons unexpectedly complain of symptoms now than five years ago. The incidence of symptoms in this group is now approximately equal to that of the veterinary surgeons in private practice, although the latter continue to have much greater exposure to brucella infection. Alternative explanations for this increase are discussed.

The only certain method of diagnosing active brucellosis in a patient is to culture the organism from the blood or other tissues. Unfortunately, such a culture is obtained infrequently even in the acute case. No other laboratory test can be relied upon to prove that the disease is actively present. Thus the patient's symptoms may be vital in reaching a decision in a particular case.

The symptoms ascribed to brucellosis are notoriously nonspecific and as many as 150 are on record (Elberg, 1965), but a symptom pattern for chronic brucellosis has been described, consisting of sweating, lassitude, malaise, gastritis, enteritis, abdominal pain, skin rashes, headache, irritability, depression, insomnia, rheumatism, arthritis, and backache, although not all of these need be manifest in any one

case (Kerr, Coghlan, Payne, and Robertson, 1966). The relevance of these non-specific symptoms to any disease or to drug toxicity has been questioned by Reidenberg and Lowenthal (1968). They carried out a questionnaire survey in Philadelphia into the symptom experience during the previous 24 hours of a group of 414 people who had no current illness and were not taking any drug. Only 19% of the group had experienced none of the 25 symptoms enquired about and, of the remaining 81%, many admitted to fatigue, irritability, insomnia, loss of appetite, diarrhoea, constipation, giddiness or weakness, headaches or pains in the joints or muscles. They pointed out the similarity between these symptoms and those ascribed to such diseases as psychoneurosis, 'non-myxomatous hypometabolism',

'normocalcaemic hypoparathyroidism', and 'sideropaenia', the existence of some of which is now questioned.

This appears to raise certain doubts about accepting chronic brucellosis as a distinct entity. Might these symptoms arise no more commonly in persons occupationally exposed to brucella infection than in those who are not? Could the incidence of such symptoms in veterinary surgeons be explained by factors other than infection, e.g., the physical exertion or long hours involved? This paper describes an attempt to answer these questions.

Methods

Four different occupational groups in Northern Ireland were investigated:

(a) veterinary surgeons who work in private practice. They are engaged in bovine midwifery and have previously been shown to have the highest levels of serological antibodies to *Brucella abortus* of any occupational group in Northern Ireland (McDevitt and McCaughey, 1969).

(b) veterinary surgeons who work for the Ministry of Agriculture. They work office hours and are engaged in tuberculosis and brucellosis eradication in cattle or in meat inspection. Their serological brucella antibody levels are significantly lower than those of group (a) but much higher than those of the general population (McDevitt and McCaughey, 1969; McDevitt, 1970a).

(c) medical practitioners who work in general practice in rural areas. Each medical practitioner was chosen because he worked in the same area as one of the veterinary surgeons in private practice. This group was intended to represent professional status similar to that of the veterinary surgeons.

(d) a group of forestry workers employed by the Ministry of Agriculture who work both with timber and at other outdoor labouring. They were chosen because

their job demands heavy physical effort but no contact with cattle.

Each person was asked to complete a postal questionnaire. Specific information was sought as to whether they had experienced any of the following symptoms regularly or recurrently in the previous 12 months: sweating, weakness, malaise, abdominal pain, vomiting, constipation, diarrhoea, loss of appetite, headache, irritability, depression, insomnia, rheumatism, arthritis or backache. Information about age group, contact with cattle, and ill health was also sought.

In the various occupational groups, differences were assessed by means of the χ^2 test when the numbers were sufficient. When the numbers were too small for the valid application of χ^2 , the exact double-tail probability test was used. In either case differences were considered significant when the probability (P) was less than 0.05.

Results

The composition of the occupational groups investigated is shown in Table 1. There were 114 veterinary surgeons in private practice in Northern Ireland at the time of this study. Of these, information was obtained from 91 (79.8%), from whom a further nine were excluded because they were engaged in small animal practice only and had no contact with cattle. Ninety-nine veterinary surgeons (89.2%) out of a possible total of 111 employed by the Ministry of Agriculture returned symptomatology questionnaires. Of the general medical practitioners approached, 106 (91.4%) supplied information; two were subsequently excluded because of regular contact with cattle and two others because the information supplied about age group was inadequate. One hundred forestry workers were chosen arbitrarily and 86 co-operated in the study,

TABLE 1
OCCUPATIONAL GROUPS INVESTIGATED AND PROPORTIONS WITH SYMPTOMS

Occupational group	Total in group	No. from whom information obtained	No. in group investigated	With symptoms	No symptoms
Veterinary surgeons in private practice	114 (100.0)	91 (79.8)	82 ¹ (100.0)	40 (48.9)	4 (51.1)
Ministry veterinary surgeons	111 (100.0)	99 (89.2)	99 (100.0)	46 (46.5)	53 (53.5)
General practitioners	116 (100.0)	106 (91.4)	102 ² (100.0)	28 (27.5)	74 (72.5)
Forestry workers	100 (100.0)	86 (86.0)	82 ³ (100.0)	16 (19.5)	66 (80.5)

$\chi^2 = 23.5$; DF = 3; P < 0.001

¹9 veterinary surgeons with no cattle contact excluded

²2 general practitioners with cattle contact and 2 who did not reveal age group excluded

³4 forestry workers with cattle contact excluded

Percentages are given in parentheses.

though four were later excluded because of cattle contact.

Occurrence of symptoms

The proportions of people admitting to one or more of the symptoms inquired about is also shown in Table 1. It can be seen that more veterinary surgeons had symptoms than those in the other groups and that the difference was significant, but it is worthy of note that even in the forestry workers with least symptom experience one in five had had one or more of the symptoms regularly or recurrently in the previous 12 months.

Influence of age

As two of the groups were of fixed composition and the two control groups were not matched, it was thought that they might differ in other characteristics besides symptom experience. Table 2 shows the distribution of the various occupational groups with age, revealing that the majority of the Ministry veterinarians and the general medical practitioners were in the 50+ years age group while the veterinary surgeons in private practice and the forestry workers were generally younger. The difference in distribution is highly significant.

TABLE 2
AGE DISTRIBUTION WITHIN THE OCCUPATIONAL GROUPS

Age group (years)	Private veterinary surgeons	Ministry veterinary surgeons	General practitioners	Forestry workers	Total
< 40	29 (35.4)	16 (16.2)	10 (9.8)	40 (48.8)	95
40-49	27 (32.9)	31 (31.3)	39 (38.2)	28 (34.1)	125
50+	26 (31.7)	52 (52.5)	53 (52.0)	14 (17.1)	145
Total	82 (100.0)	99 (100.0)	102 (100.0)	82 (100.0)	365

$\chi^2 = 53.7$; DF = 6; $P < 0.001$

Percentages are given in parentheses.

Because of this relationship between age and occupation it was necessary to rule out the possibility that age might be significantly related to the occurrence of the various symptoms investigated. A series of exact probability tests was carried out, therefore, to compare the incidence of each symptom between the three age groups for each occupation separately. Of these 30 comparisons, three were significant and at least one of these might be expected to occur by chance at the 5% level. These were all confined to

the veterinary surgeons in private practice. In this group sweating was significantly more common in the 40-49 years age group ($P = 0.023$), as was insomnia ($P = 0.025$), and rheumatism was largely confined to the 40-49 years and 50+ years groups ($P = 0.037$). Otherwise age and symptoms did not appear to be related significantly, although it must be pointed out that with small numbers only large differences will be detected as significant.

Prevalence of individual symptoms

Data for the occurrence of individual symptoms in the different occupational groups are shown in Table 3. Because of the relationship between sweating, insomnia, and rheumatism and age previously shown, these symptoms have been analysed within the various occupations for each age group by exact probability tests. For the other symptoms each group has been taken as a whole.

It can be seen that in the occurrence of alimentary system symptoms (abdominal pain, vomiting, diarrhoea, constipation, and loss of appetite) there was no significant difference between the cattle-exposed occupations and the others, nor did the increased incidence of headache in veterinary surgeons reach significant proportions.

Weakness, malaise, irritability, depression, arthritis, and backache did differ significantly between the occupational groups, generally occurring more frequently in the veterinary surgeons than in the others. In some instances there were quite marked differences in symptom occurrences between the two types of veterinary practice.

Sweating occurred significantly more often in veterinary surgeons in private practice in the 40-49 years age group than in any other group of the same age ($P < 0.0001$), but in the under 40 and in the 50+ years age groups there were no significant differences between the various occupations. The distribution of insomnia did not differ significantly between the occupations in the various age groups but rheumatism occurred most often in veterinary surgeons working for the Ministry in the under 40 years age group ($P = 0.014$) and in private veterinarians in the 40-49 years age group ($P = 0.007$). No value could be obtained for the 50+ years age group.

Discussion

The results obtained in this study demonstrate that some of the symptoms commonly ascribed to brucellosis occur more frequently in veterinary surgeons than in either general medical practitioners or forestry workers. The incidence of these chronic symptoms is clearly greater than that which may be expected in the general population, even on an acute basis (Reidenberg and Lowenthal, 1968).

TABLE 3
PREVALENCE OF INDIVIDUAL SYMPTOMS WITHIN THE OCCUPATIONAL GROUPS

Symptom	Number of persons with symptoms				Difference
	Private veterinary surgeons	Ministry veterinary surgeons	General practitioners	Forestry workers	
Sweating	16 (19.5)	7 (7.1)	1 (1.0)	1 (1.2)	*
Weakness	12 (14.6)	10 (10.1)	2 (2.0)	1 (1.2)	S
Malaise	17 (20.7)	25 (25.3)	7 (6.9)	6 (7.3)	S
Abdominal pains	10 (12.2)	7 (7.1)	5 (4.9)	3 (3.7)	NS
Vomiting	2 (2.4)	2 (2.0)	1 (1.0)	1 (1.2)	NS
Diarrhoea	6 (7.3)	3 (3.0)	6 (5.9)	4 (4.9)	NS
Constipation	4 (4.9)	6 (6.1)	4 (3.9)	4 (4.9)	NS
Loss of appetite	2 (2.4)	2 (2.0)	1 (1.0)	2 (2.4)	NS
Headache	17 (20.7)	15 (15.2)	8 (7.8)	9 (11.0)	NS
Irritability	18 (22.0)	15 (15.2)	9 (8.8)	4 (4.9)	S
Depression	13 (15.9)	17 (17.2)	3 (2.9)	3 (3.7)	S
Insomnia	9 (11.0)	8 (8.1)	6 (5.9)	3 (3.7)	*
Rheumatism	13 (15.9)	17 (17.2)	8 (7.8)	2 (2.4)	*
Arthritis	9 (11.0)	17 (17.2)	4 (3.9)	2 (2.4)	S
Backache	21 (25.6)	25 (25.3)	14 (13.7)	9 (11.0)	S
No. in group	82 (100.0)	99 (100.0)	102 (100.0)	82 (100.0)	

*For statistical analysis see text
Percentages are shown in parentheses
S = Significant
NS = Not significant.

These symptoms would not appear to be a consequence of age and their low occurrence rate in the forestry workers seems to exclude heavy physical exertion as a cause. General medical practitioners work irregular hours and may have night calls to attend to; in addition, they have professional familiarity with disease, although their awareness of brucellosis may not be as great as that of the veterinary surgeon. However, the conclusion that these factors are unimportant in the occurrence of symptoms appears to be justified. Contact with cattle, one of the factors separating the veterinary surgeon from the other groups, has previously been shown to increase the prevalence of serologically positive tests for brucella antibody in Northern Ireland (McDevitt and McCaughey, 1969). Thus the difference in symptom experience between the

veterinary surgeon and the others might be the consequence of exposure to brucella infection.

If these symptoms do represent brucellosis in the individuals concerned, it appears that the symptom pattern enunciated by Kerr *et al.* (1966) should be amended to exclude alimentary system symptoms and insomnia as these do not occur significantly more often in veterinary surgeons than in others. The evidence for the inclusion of headache is equivocal as, with the numbers investigated, its occurrence, particularly in veterinary surgeons in private practice, fell just short of significance. The symptom complex thus shortens to sweating, weakness, malaise, irritability, depression, rheumatism, arthritis, and backache, with selective differences likely to occur between the various types of veterinary practice.

There is, however, one anomaly in interpreting these symptoms as representing brucella infection. It has been shown previously that veterinary surgeons working in private practice have greater exposure to brucellosis than those employed by the Ministry (McDevitt, 1970a). It would be expected, therefore, that more veterinarians in private practice would complain of symptoms than Ministry employees, and this was so in the previous study when 40.8% of private practitioners admitted to symptoms, in contrast to 18.8% of Ministry veterinary surgeons (McDevitt, 1970b). As the questionnaire at that time was less explicit about duration or frequency of symptoms, it might be expected that the figures obtained then would have been greater than the present ones, but while the proportion of symptomatic private practitioners in the present survey is approximately the same as that obtained five years ago, the proportion of Ministry veterinary surgeons complaining of symptoms has significantly increased in that time and is now approximately equal to that of the veterinary surgeons in private practice.

Several possible factors could account for this change. Veterinary surgeons developing symptoms in private practice might have changed to work for the Ministry as offering a less arduous and more regular job. This applies to a maximum of seven veterinary surgeons, insufficient to explain the overall trend. Secondly, the Ministry veterinarians could have been more exposed to brucella infection in the last five years, but during this period the serological brucella antibody titre values in this group have generally shown a downward trend (Shepherd, 1972), suggesting the opposite. Two other explanations might be offered. Too frequent exposure to questionnaires may produce bizarre results, but against this is the continuity of results in the privately practising group. Alternatively, the high incidence of reported symptoms in the Ministry veterinary surgeons may represent an increasing awareness of the hazards of this disease among the group at a time when industrial compensation is being considered. Malaise, depression, arthritis (more properly arthralgia), and backache are the symptoms which have increased most significantly in the five-year period in this group. These are notoriously indefinable and perhaps capable of subjective expansion in those considering their brucellosis status. Whatever the explanation, it appears to cast further doubt on the reliability of symptoms as an accurate index of the presence of active brucella infection.

It is well documented that many persons who are occupationally exposed to cattle have high serological titres of brucella antibody but are asymptomatic (McDevitt, 1970a). To this must now be added the realization that nonspecific symptoms occur frequently in normal people and must, therefore, be recognized as unimportant in some veterinary surgeons, even in the presence of high antibody levels. In addition, this study suggests that factors other than increased exposure to infection may result in an increase in symptoms in those who work with cattle, and it is important to realize that improvement of symptoms during treatment with antibiotics does not necessarily substantiate the diagnosis of brucellosis (McDevitt, 1970c).

It appears that the pendulum has swung too far. From a time when the diagnosis was seldom made, we are now in danger of accepting it in anyone with raised serological brucella antibody titres and vague symptoms. In an individual patient, chronic brucellosis must be diagnosed only after careful and critical appraisal of the clinical and epidemiological factors, preferably by a physician with experience of the disease.

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